



02356.0086 SEQUENCE LISTING
SEQUENCE LISTING

<110> Institut Pasteur

<120> PLASMODIUM FALCIPARUM ANTIGENS AND VACCINE AND DIAGNOSTIC USES THEREOF

<130> 000466-0035

<150> CA 2,345,206

<151> 2001-05-16

<150> CA 2,346,968

<151> 2001-05-23

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<170> PatentIn version 3.1

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<212> DNA

<213> Plasmodium falciparum

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ataatgactacagaaggttcc aagtactact gtaaaacccc ctgatgaaaa acgatctgaa 240
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Asp Asn Gln Ser Asn Val Leu Asn Arg Glu Asp Pro Ile Ala Ser Glu
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Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile Met Thr Thr
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Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu Lys Arg Ser Glu
65 70 75 80

Glu Val Gly Glu Lys Glu Ala Lys Glu Ile Lys Val Glu Pro Val Val
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Pro Pro Lys Glu Phe
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Asp Trp Ile Asn Gln Ile Phe Lys Lys Asn Ser Leu Gln Cys Asp Leu
20 25 30 96tat ttt ttg gat gac aac aaa gaa aaa gat gtt agt aag aaa aga aaa
Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
35 40 45 144gct caa ttg aag gat gaa tat gat aat ata tca agg agc aaa gaa aat
Ala Gln Leu Lys Asp Glu Tyr Asp Asn Ile Ser Arg Ser Lys Glu Asn
50 55 60 192

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aaa aat gat tat aaa aag tgt aat aaa aat gtt ata aaa agt gat aat Lys Asn Asp Tyr Lys Lys Cys Asn Lys Asn Val Ile Lys Ser Asp Asn 115 120 125	384
aaa aat gtt ata aaa agt gat aat aaa aat gtt ata aaa agt gat aat Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn 130 135 140	432
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tcc gat ata aaa agt gaa gat gaa tat ata gaa cca tat gaa aaa aag Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys 210 215 220	672
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Ile Tyr Val Ile Glu His Ile Asp Lys Ile Tyr Tyr Asp Thr Phe Leu				
340	345	350		
aat aaa aat cca agt gaa aaa agt gtt ttt atg aat gat gaa tct act				1104
Asn Lys Asn Pro Ser Glu Lys Ser Val Phe Met Asn Asp Glu Ser Thr				
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ggt tat ttg aaa aat gat gtg aat gac aaa tgt gtt gtt gat aat ata				1152
Gly Tyr Leu Lys Asn Asp Val Asn Asp Lys Cys Val Val Asp Asn Ile				
370	375	380		
aat gtt att aat cct tct agt gtg aat acg ttg agt aat att tca aat				1200
Asn Val Ile Asn Pro Ser Ser Val Asn Thr Leu Ser Asn Ile Ser Asn				
385	390	395	400	
att agg aat gaa aaa ata gaa aat aat aat aag aat gaa aaa tta ata				1248
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aaa tca tat cct aca caa tca aaa aat gtt atg agt aca ttt tcc ttt				1296
Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe				
420	425	430		
tgg aat att gaa aag gag aca ttt ata aca aaa cct ttg tat gca caa				1344
Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln				
435	440	445		
aat ttg aga aaa aaa caa ttt agt tta tta gat gaa tct gaa gag atg				1392
Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met				
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Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg				
465	470	475	480	
cat tta tta tat gta atg agt caa gtt gct tct cga tcc ttt ttt gat				1488
His Leu Leu Tyr Val Met Ser Gln Val Ala Ser Arg Ser Phe Phe Asp				
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Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
35 40 45

Ala Gln Leu Lys Asp Glu Tyr Asp Asn Ile Ser Arg Ser Lys Glu Asn
50 55 60

Ile Asn Asn Ser Lys Lys Ile Lys Asn Glu Leu Ser Ile Lys Asp Asn
65 70 75 80

Met His Asp Tyr Ile Tyr Asp Asp Arg Ile Tyr Asn Asn Asp Lys Glu
85 90 95

Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
100 105 110

Lys Asn Asp Tyr Lys Lys Cys Asn Lys Asn Val Ile Lys Ser Asp Asn
115 120 125

Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
130 135 140

Lys Asn Val Ile Lys Ser Asp Tyr Lys Ser Asp Asp Arg Asn Ala Cys
145 150 155 160

Asp Ile Tyr Lys Ser Asn Lys Lys Asn Val Pro Asp Asn Cys His Ile
165 170 175

Tyr Asp Asp Asn Ser Ser Val Glu Asn Leu Asp Gly Lys Asn Lys Leu
180 185 190

Asn Asn Ile Arg Asn Ile His Asn Asp Asn Ser Ser Ser Cys Asp Ile
195 200 205

Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys
210 215 220

Asn Glu Glu Asn Ile Asn Glu Tyr Lys Asn Lys Lys Asn Ile Ala Asn
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Glu Asn Ile Lys Glu Gly Lys Ser Ser Ile Tyr Asn Asp Glu His Asn
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Tyr Asn Ser Leu Leu Tyr Asn Ser Cys Asn Gly Glu Ile Ser Lys Ile
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290 295 300

Glu Asp Asn Ile Ser Asn Tyr Tyr Asn Gly Lys Asp Val Leu Asn Asp
305 310 315 320

Glu Ile Met Phe Pro Ile Lys Phe Asn Phe Glu Lys Leu Lys Lys Asn
325 330 335

Ile Tyr Val Ile Glu His Ile Asp Lys Ile Tyr Tyr Asp Thr Phe Leu
340 345 350

Asn Lys Asn Pro Ser Glu Lys Ser Val Phe Met Asn Asp Glu Ser Thr
355 360 365

Gly Tyr Leu Lys Asn Asp Val Asn Asp Lys Cys Val Val Asp Asn Ile
370 375 380

Asn Val Ile Asn Pro Ser Ser Val Asn Thr Leu Ser Asn Ile Ser Asn
385 390 395 400

Ile Arg Asn Glu Lys Ile Glu Asn Asn Asn Lys Asn Glu Lys Leu Ile
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Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe
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Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln
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Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met
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Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg
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His Leu Leu Tyr Val Met Ser Gln Val Ala Ser Arg Ser Phe Phe Asp
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tat gtt gta tta tgt acc tat gta tta ggt ata agt gaa gag tat ttg 96
Tyr Val Val Leu Cys Thr Tyr Val Leu Gly Ile Ser Glu Glu Tyr Leu
20 25 30
aag gaa agg ccc caa ggt tta aat gtt gag act aat aat aat aat aat 144
Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn Asn
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40

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aat aat aat aat aat aat agt aat agt aac gat gcg atg tct ttt gta Asn Asn Asn Asn Asn Asn Ser Asn Ser Asn Asp Ala Met Ser Phe Val	192
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65 70 75 80	
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85 90 95	
tat cca gtt agt tct ttt ctg aat atc aaa aag tat ggt agg aaa ggg Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly	336
100 105 110	
gaa tat ttg aat aga aat agt ttt gtt caa aga tca tat ata agg ggt Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly	384
115 120 125	
tgt aaa gga aaa aga agc aca cat aca tgg ata tgt gaa aat aaa ggg Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly	432
130 135 140	
aat aat aat ata tgt att cct gat aga cgt gta caa tta tgt ata aca Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr	480
145 150 155 160	
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165 170 175	
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180 185 190	
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195 200 205	
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210 215 220	
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225 230 235 240	
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245 250 255	
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260 265 270	
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gtg agt gtc gca agt ggt aat aaa gaa atc gaa aag agt aag gat gaa Val Ser Val Ala Ser Gly Asn Lys Glu Ile Glu Lys Ser Lys Asp Glu 770 775 780	2352
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835	840	845	
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850	855	860	
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865	870	875	
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885	890	895	
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900	905	910	
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930	935	940	
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980	985	990	
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gaa aca tca aaa agt aat tta gaa aaa cct aag gat gtt gaa cct Glu Thr Ser Lys Ser Asn Leu Glu Lys Pro Lys Asp Val Glu Pro 1100 1105 1110			3339
tct cat gaa ata tct gaa cct gtt ctt tct ggt aca act ggt aaa Ser His Glu Ile Ser Glu Pro Val Leu Ser Gly Thr Gly Lys 1115 1120 1125			3384
gaa gaa tca gag tta tta aaa agt aaa tcg ata gag acg aag ggg Glu Glu Ser Glu Leu Leu Lys Ser Lys Ser Ile Glu Thr Lys Gly 1130 1135 1140			3429
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gta gat aat caa agt aat gtt tta aat aga gaa gat cct att gct Val Asp Asn Gln Ser Asn Val Leu Asn Arg Glu Asp Pro Ile Ala 1175 1180 1185			3564
tct gaa act gaa gtt gta agt gaa cct gag gat tca agt agg ata Ser Glu Thr Glu Val Val Ser Glu Pro Glu Asp Ser 1200			3609
atg act aca gaa gtt cca agt act act gta aaa ccc cct gat gaa Met Thr Thr Glu Val Pro Ser Thr Thr Val Lys Pro Asp Glu 1205 1210 1215			3654
aaa cga tct gaa gaa gta gga gaa aaa gaa gct aaa gaa att aaa Lys Arg Ser Glu Glu Val Gly 1225 Glu Lys Glu Ala Lys 1230 Glu Ile Lys 1220			3699
gta gaa cct gtt gta cca aga gcc att gga gaa cca atg gaa aat Val Glu Pro Val Val Pro Arg Ala Ile Gly Glu Pro Met Glu Asn 1235 1240 1245			3744
tct gtg agc gta cag tcc cct cct aat gta gaa gat gtt gaa aaa Ser Val Ser Val Gln Ser Pro Pro Asn Val Glu Asp Val Glu Lys 1250 1255 1260			3789
gaa aca ttg ata tct gag aat aat gga tta cat aat gat aca cac Glu Thr Leu Ile Ser Glu Asn Asn Gly Leu His Asn Asp Thr His 1265 1270 1275			3834
aga gga aat atc agt gaa aag gat tta atc gat att cat ttg tta			3879

02356.0086 SEQUENCE LISTING

Arg	Gly	Asn	Ile	Ser	Glu	Lys	Asp	Leu	Ile	Asp	Ile	His	Leu	Leu		
1280						1285						1290				
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Arg	Asn	Glu	Ala	Gly	Ser	Thr	Ile	Leu	Asp	Asp	Ser	1305	Arg	Arg	Asn	
1295						1300										
gga	gaa	atg	aca	gaa	ggc	agt	acg	gaa	agt	gat	gtt	gga	gaa	tta	caa	3969
Gly	Glu	Met	Thr	Glu	Gly	Ser	1315	Glu	Ser	Asp	Val	Gly	Glu	Leu	Gln	
1310												1320				
gaa	cat	aat	ttt	agc	aca	caa	caa	aaa	gat	gaa	aaa	gat	ttt	gac		4014
Glu	His	Asn	Phe	Ser	Thr	Gln	Gln	Lys	Asp	Glu	Lys	Asp	Phe	Asp		
1325						1330					1335					
caa	att	gcg	agc	gat	aga	gaa	aaa	gaa	gaa	att	caa	aaa	tta	ctt		4059
Gln	Ile	Ala	Ser	Asp	Arg	Glu	Lys	Glu	Glu	Ile	Gln	Lys	Leu	Leu		
1340						1345					1350					
aat	ata	gga	cat	gaa	gag	gat	gaa	gat	gta	tta	aaa	atg	gat	aga		4104
Asn	Ile	Gly	His	Glu	Glu	Asp	Glu	Glu	Asp	Val	Leu	Lys	Met	Asp	Arg	
1355						1360					1365					
aca	gag	gat	agt	atg	agt	gat	gga	gtt	aat	agt	cat	ttg	tat	tat		4149
Thr	Glu	Asp	Ser	Met	Ser	Asp	1370	Gly	Val	Asn	Ser	His	Leu	Tyr	Tyr	
						1375					1380					
aat	aat	cta	tca	agt	gaa	gaa	aaa	atg	gaa	caa	tat	aat	aat	aga		4194
Asn	Asn	Leu	Ser	Ser	Glu	Glu	Lys	Met	Glu	Gln	Tyr	Asn	Asn	Arg		
1385						1390					1395					
gat	gct	tct	aaa	gat	aga	gaa	gaa	ata	ttg	aat	agg	tca	aac	aca		4239
Asp	Ala	Ser	Lys	Asp	Arg	Glu	Glu	Glu	Ile	Leu	Asn	Arg				
1400						1405					1410					
aat	aca	tgt	tct	aat	gaa	cat	tca	tta	aaa	tat	tgt	caa	tat	atg		4284
Asn	Thr	Cys	Ser	Asn	Glu	His	Ser	Leu	Lys	Tyr	Cys	Gln	Tyr	Met		
1415						1420					1425					
gaa	aga	aat	aag	gat	tta	tta	gaa	aca	tgt	tct	gaa	gac	aaa	agg		4329
Glu	Arg	Asn	Lys	Asp	Leu	Leu	Glu	Thr	Cys	Ser	Glu	Asp	Lys	Arg		
1430						1435					1440					
tta	cat	tta	tgt	tgt	gaa	ata	tca	gat	tat	tgt	tta	aaa	ttt	ttc		4374
Leu	His	Leu	Cys	Cys	Glu	Ile	Ser	Asp	Tyr	Cys	Leu	Lys	Phe	Phe		
1445						1450					1455					
aat	cct	aaa	tcg	ata	gaa	tac	ttt	gat	tgt	aca	caa	aaa	gaa	ttt		4419
Asn	Pro	Lys	Ser	Ile	Glu	Tyr	Phe	Asp	Cys	Thr	Gln	Lys	Glu	Phe		
1460						1465					1470					
gat	gac	cct	aca	tat	aat	tgt	ttt	aga	aaa	caa	aga	ttt	aca	agt		4464
Asp	Asp	Pro	Thr	Tyr	Asn	Cys	Phe	Arg	Lys	Gln	Arg	Phe	Thr	Ser		
1475						1480					1485					
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1490															1495	
ggt ata ata gcc ctt tta ttg ttt att tta ggt tca gcc agc tat Gly Ile Ile Ala Leu Leu Leu Phe Ile Leu Gly Ser Ala Ser Tyr															4622	

02356.0086 SEQUENCE LISTING

1500

1505

1510

agg aag aat ttg taagaaaaaa aggatgaaga aatataaaca aaaatataaa 4674
 Arg Lys Asn Leu

tatatgcata tatatttaag tattataaga acatatatat aaataaatat gtatatttt 4734

attttattat tatagg gat gat gaa aaa gga ttc tac gat tct aat tta 4783
 Asp Asp Glu Lys Gly Phe Tyr Asp Ser Asn Leu
 1515 1520 1525

aat gat tct gct ttt gaa tat aat aat aat aaa tat aat aaa tta 4828
 Asn Asp Ser Ala Phe Glu Tyr Asn Asn Asn Lys Tyr Asn Lys Leu
 1530 1535 1540

cct tat atg tgtaaggaaa aaactaaaaa acaaaaaaaaaa aaaaaaatat 4877
 Pro Tyr Met

atatatatat atatatattt acggatgcat ttccacattc ctattatttc ttattcttat 4937

aatttttatt atttattttt ttatTTTT ttttc gta gtt gat caa caa ata 4990
 Val Val Asp Gln Gln Ile
 1545

aat gta gta aat tct gat tta tat tcg gag ggt att tat gat gac 5035
 Asn Val Val Asn Ser Asp Leu Tyr Ser Glu Gly Ile Tyr Asp Asp
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aca acg aca ttt taa 5050
 Thr Thr Thr Phe
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<213> Plasmodium falciparum

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Tyr Val Val Leu Cys Thr Tyr Val Leu Gly Ile Ser Glu Glu Tyr Leu
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Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn
 35 40 45

Asn Asn Asn Asn Asn Ser Asn Ser Asn Asp Ala Met Ser Phe Val
 50 55 60

02356.0086 SEQUENCE LISTING
Asn Glu Val Ile Arg Phe Ile Glu Asn Glu Lys Asp Asp Lys Glu Asp
65 70 75 80

Lys Lys Val Lys Ile Ile Ser Arg Pro Val Glu Asn Thr Leu His Arg
85 90 95

Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly
100 105 110

Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly
115 120 125

Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly
130 135 140

Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr
145 150 155 160

Ala Leu Gln Asp Leu Lys Asn Ser Gly Ser Glu Thr Thr Asp Arg Lys
165 170 175

Leu Leu Arg Asp Lys Val Phe Asp Ser Ala Met Tyr Glu Thr Asp Leu
180 185 190

Leu Trp Asn Lys Tyr Gly Phe Arg Gly Phe Asp Asp Phe Cys Asp Asp
195 200 205

Val Lys Asn Ser Tyr Leu Asp Tyr Lys Asp Val Ile Phe Gly Thr Asp
210 215 220

Leu Asp Lys Asn Asn Ile Ser Lys Leu Val Glu Glu Ser Leu Lys Arg
225 230 235 240

Phe Phe Lys Lys Asp Ser Ser Val Leu Asn Pro Thr Ala Trp Trp Arg
245 250 255

Arg Tyr Gly Thr Arg Leu Trp Lys Thr Met Ile Gln Pro Tyr Ala His
260 265 270

Leu Gly Cys Arg Lys Pro Asp Glu Asn Glu Pro Gln Ile Asn Arg Trp
275 280 285

Ile Leu Glu Trp Gly Lys Tyr Asn Cys Arg Leu Met Lys Glu Lys Glu
290 295 300

Lys Leu Leu Thr Gly Glu Cys Ser Val Asn Arg Lys Lys Ser Asp Cys
305 310 315 320

02356.0086 SEQUENCE LISTING

Ser Thr Gly Cys Asn Asn Glu Cys Tyr Thr Tyr Arg Ser Leu Ile Asn
325 330 335

Arg Gln Arg Tyr Glu Val Ser Ile Leu Gly Lys Lys Tyr Ile Lys Val
340 345 350

Val Arg Tyr Thr Ile Phe Arg Arg Lys Ile Val Gln Pro Asp Asn Ala
355 360 365

Leu Asp Phe Leu Lys Leu Asn Cys Ser Glu Cys Lys Asp Ile Asp Phe
370 375 380

Lys Pro Phe Phe Glu Phe Glu Tyr Gly Lys Tyr Glu Glu Lys Cys Met
385 390 395 400

Cys Gln Ser Tyr Ile Asp Leu Lys Ile Gln Phe Lys Asn Asn Asp Ile
405 410 415

Cys Ser Phe Asn Ala Gln Thr Asp Thr Val Ser Ser Asp Lys Arg Phe
420 425 430

Cys Leu Glu Lys Lys Glu Phe Lys Pro Trp Lys Cys Asp Lys Asn Ser
435 440 445

Phe Glu Thr Val His His Lys Gly Val Cys Val Ser Pro Arg Arg Gln
450 455 460

Gly Phe Cys Leu Gly Asn Leu Asn Tyr Leu Leu Asn Asp Asp Ile Tyr
465 470 475 480

Asn Val His Asn Ser Gln Leu Leu Ile Glu Ile Ile Met Ala Ser Lys
485 490 495

Gln Glu Gly Lys Leu Leu Trp Lys Lys His Gly Thr Ile Leu Asp Asn
500 505 510

Gln Asn Ala Cys Lys Tyr Ile Asn Asp Ser Tyr Val Asp Tyr Lys Asp
515 520 525

Ile Val Ile Gly Asn Asp Leu Trp Asn Asp Asn Asn Ser Ile Lys Val
530 535 540

Gln Asn Asn Leu Asn Leu Ile Phe Glu Arg Asn Phe Gly Tyr Lys Val
545 550 555 560

Gly Arg Asn Lys Leu Phe Lys Thr Ile Lys Glu Leu Lys Asn Val Trp
565 570 575

02356.0086 SEQUENCE LISTING

Trp Ile Leu Asn Arg Asn Lys Val Trp Glu Ser Met Arg Cys Gly Ile
580 585 590

Asp Glu Val Asp Gln Arg Arg Lys Thr Cys Glu Arg Ile Asp Glu Leu
595 600 605

Glu Asn Met Pro Gln Phe Phe Arg Trp Phe Ser Gln Trp Ala His Phe
610 615 620

Phe Cys Lys Glu Lys Glu Tyr Trp Glu Leu Lys Leu Asn Asp Lys Cys
625 630 635 640

Thr Gly Asn Asn Gly Lys Ser Leu Cys Gln Asp Lys Thr Cys Gln Asn
645 650 655

Val Cys Thr Asn Met Asn Tyr Trp Thr Tyr Thr Arg Lys Leu Ala Tyr
660 665 670

Glu Ile Gln Ser Val Lys Tyr Asp Lys Asp Arg Lys Leu Phe Ser Leu
675 680 685

Ala Lys Asp Lys Asn Val Thr Thr Phe Leu Lys Glu Asn Ala Lys Asn
690 695 700

Cys Ser Asn Ile Asp Phe Thr Lys Ile Phe Asp Gln Leu Asp Lys Leu
705 710 715 720

Phe Lys Glu Arg Cys Ser Cys Met Asp Thr Gln Val Leu Glu Val Lys
725 730 735

Asn Lys Glu Met Leu Ser Ile Asp Ser Asn Ser Glu Asp Ala Thr Asp
740 745 750

Ile Ser Glu Lys Asn Gly Glu Glu Leu Tyr Val Asn His Asn Ser
755 760 765

Val Ser Val Ala Ser Gly Asn Lys Glu Ile Glu Lys Ser Lys Asp Glu
770 775 780

Lys Gln Pro Glu Lys Glu Ala Lys Gln Thr Asn Gly Thr Leu Thr Val
785 790 795 800

Arg Thr Asp Lys Asp Ser Asp Arg Asn Lys Gly Lys Asp Thr Ala Thr
805 810 815

Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr

820

02356.0086 SEQUENCE LISTING
825
830

Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser
835 840 845

Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln
850 855 860

Lys Gln Glu Glu Glu Pro Lys Lys Gln Glu Glu Glu Pro Lys Lys
865 870 875 880

Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln
885 890 895

Glu Glu Glu Glu Gln Lys Gln Glu Glu Gln Gln Ile Gln Asp Gln
900 905 910

Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu
915 920 925

Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser
930 935 940

Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln
945 950 955 960

Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp
965 970 975

Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu
980 985 990

Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys
995 1000 1005

Asp Asp Lys Lys Glu Val Asp Asp Ala Lys Lys Glu Leu Gln Ser
1010 1015 1020

Thr Val Ser Arg Ile Glu Ser Asn Glu Gln Asp Val Gln Ser Thr
1025 1030 1035

Pro Pro Glu Asp Thr Pro Thr Val Glu Gly Lys Val Gly Asp Lys
1040 1045 1050

Ala Glu Met Leu Thr Ser Pro His Ala Thr Asp Asn Ser Glu Ser
1055 1060 1065

02356.0086 SEQUENCE LISTING
Glu Ser Gly Leu Asn Pro Thr Asp Asp Ile Lys Thr Thr Asp Gly
1070 1075 1080

Val Val Lys Glu Gln Glu Ile Leu Gly Gly Gly Glu Ser Ala Thr
1085 1090 1095

Glu Thr Ser Lys Ser Asn Leu Glu Lys Pro Lys Asp Val Glu Pro
1100 1105 1110

Ser His Glu Ile Ser Glu Pro Val Leu Ser Gly Thr Thr Gly Lys
1115 1120 1125

Glu Glu Ser Glu Leu Leu Lys Ser Lys Ser Ile Glu Thr Lys Gly
1130 1135 1140

Glu Thr Asp Pro Arg Ser Asn Asp Gln Glu Asp Ala Thr Asp Asp
1145 1150 1155

Val Val Glu Asn Ser Arg Asp Asp Asn Asn Ser Leu Ser Asn Ser
1160 1165 1170

Val Asp Asn Gln Ser Asn Val Leu Asn Arg Glu Asp Pro Ile Ala
1175 1180 1185

Ser Glu Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile
1190 1195 1200

Met Thr Thr Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu
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Lys Arg Ser Glu Glu Val Gly Glu Lys Glu Ala Lys Glu Ile Lys
1220 1225 1230

Val Glu Pro Val Val Pro Arg Ala Ile Gly Glu Pro Met Glu Asn
1235 1240 1245

Ser Val Ser Val Gln Ser Pro Pro Asn Val Glu Asp Val Glu Lys
1250 1255 1260

Glu Thr Leu Ile Ser Glu Asn Asn Gly Leu His Asn Asp Thr His
1265 1270 1275

Arg Gly Asn Ile Ser Glu Lys Asp Leu Ile Asp Ile His Leu Leu
1280 1285 1290

Arg Asn Glu Ala Gly Ser Thr Ile Leu Asp Asp Ser Arg Arg Asn
1295 1300 1305

02356.0086 SEQUENCE LISTING

Gly Glu Met Thr Glu Gly Ser Glu Ser Asp Val Gly Glu Leu Gln
1310 1315 1320

Glu His Asn Phe Ser Thr Gln Gln Lys Asp Glu Lys Asp Phe Asp
1325 1330 1335

Gln Ile Ala Ser Asp Arg Glu Lys Glu Glu Ile Gln Lys Leu Leu
1340 1345 1350

Asn Ile Gly His Glu Glu Asp Glu Asp Val Leu Lys Met Asp Arg
1355 1360 1365

Thr Glu Asp Ser Met Ser Asp Gly Val Asn Ser His Leu Tyr Tyr
1370 1375 1380

Asn Asn Leu Ser Ser Glu Glu Lys Met Glu Gln Tyr Asn Asn Arg
1385 1390 1395

Asp Ala Ser Lys Asp Arg Glu Glu Ile Leu Asn Arg Ser Asn Thr
1400 1405 1410

Asn Thr Cys Ser Asn Glu His Ser Leu Lys Tyr Cys Gln Tyr Met
1415 1420 1425

Glu Arg Asn Lys Asp Leu Leu Glu Thr Cys Ser Glu Asp Lys Arg
1430 1435 1440

Leu His Leu Cys Cys Glu Ile Ser Asp Tyr Cys Leu Lys Phe Phe
1445 1450 1455

Asn Pro Lys Ser Ile Glu Tyr Phe Asp Cys Thr Gln Lys Glu Phe
1460 1465 1470

Asp Asp Pro Thr Tyr Asn Cys Phe Arg Lys Gln Arg Phe Thr Ser
1475 1480 1485

Met His Tyr Ile Ala Gly Gly Ile Ile Ala Leu Leu Leu Phe
1490 1495 1500

Ile Leu Gly Ser Ala Ser Tyr Arg Lys Asn Leu Asp Asp Glu Lys
1505 1510 1515

Gly Phe Tyr Asp Ser Asn Leu Asn Asp Ser Ala Phe Glu Tyr Asn
1520 1525 1530

Asn Asn Lys Tyr Asn Lys Leu Pro Tyr Met Val Val Asp Gln Gln
1535 1540 1545

02356.0086 SEQUENCE LISTING

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<223> sequence is completely synthesized

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<210> 14

<211> 23

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<210> 15

<211> 25

<212> DNA

<213> artificial sequence

<220>

<223> sequence is completely synthesized

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25

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<211> 25

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25

<210> 17

<211> 22

<212> DNA

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22

<210> 18

<211> 21

<212> DNA

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<220>

<223> sequence is completely synthesized

<400> 18

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21